

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, D.C. 20555

February 22, 1994

NRC INFORMATION NOTICE 92-36, SUPPLEMENT 1: INTERSYSTEM LOCA OUTSIDE
CONTAINMENT

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

Purpose

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to inform addressees about technical findings resulting from the NRC program for resolving Generic Safety Issue (GSI) 105, "Interfacing System Loss-of-Coolant Accidents [LOCAs] at Light Water Reactors." It is expected that recipients will review the information for applicability to their facilities and consider actions as appropriate. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response is required.

This information may help licensees in their plant evaluations recommended by Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities - 10 CFR 50.54(f)," November 23, 1988. As discussed below, the NRC staff considers that participation in the individual plant examination program is sufficient to resolve GSI 105.

Background

In NRC Information Notice 92-36, the staff stated that the interfacing system loss-of-coolant accidents (ISLOCAs) of most concern are those accidents during which the break flow is discharged outside the reactor containment building. The two main reasons for this concern are: (1) potential high offsite radiological consequences caused by radioactive effluent bypassing the containment and (2) potential loss of long-term core cooling resulting from loss of reactor coolant system (RCS) inventory that would otherwise be available for recirculation from the containment sumps.

Several draft plant-specific probabilistic risk assessments (PRAs) of core damage frequency from an ISLOCA were cited in Information Notice 92-36. The PRAs have since been completed (Refs. 1-4).

The major impetus to the ISLOCA PRA program was the fact that for ISLOCA precursor events human error was a major contributor, a situation not predicted by PRAs at the time because of insufficient modeling of human error.

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The importance of human error prompted the NRC staff to question early PRA results. The staff considered that (1) the frequencies of ISLOCA precursor events that were strongly influenced by human error were higher than expected; (2) because of the potential for radioactive effluent bypassing the containment, some ISLOCA sequences could result in early release with high radiological consequences; and (3) additional PRAs were needed that accounted for the influences of human error and human response.

Discussion

The staff presented some observations in Tables 1 and 2 of Information Notice 92-36. These observations were based on root cause analyses of ISLOCA precursor events; extensive plant inspections; and detailed, but at that time incomplete, analyses of a sample of pressurized water reactors. These observations remain essentially unchanged.

The completed ISLOCA PRAs have provided the staff with useful insights in addition to those given in Table 2 of Information Notice 92-36:

- The susceptibility to an ISLOCA is highly plant specific. ISLOCA contributors important at one plant are not necessarily important at another.
- Operator errors can be important contributors. Important operator errors include valve alignment errors during transitions between operating modes.
- Recovery actions can be more important than indicated in previous PRAs. Rapid isolation of the break can prevent the compounding of potential problems with emergency core cooling equipment and borated water supplies.
- Likely locations of breaks in low-pressure systems, given ISLOCA initiations, are not readily predetermined and may require some analysis. ISLOCA training programs and simulations at some units may not include the most likely and potentially most severe break locations.
- Emergency operating procedures at some plants do not allow attention to be focused on break isolation until actions are completed that ensure injection equipment is operating properly. For large breaks, this could be inefficient use of time if some emergency core cooling equipment is susceptible to auxiliary building flooding or other damage from break effluent.
- The harsh environment of an ISLOCA may prohibit personnel access to remote stations. This may complicate long-term cooling and hinder efforts to stop the loss of coolant outside the containment.

- Symptom-based procedures may lead the operator to realize that an ISLOCA has occurred. However, unless the emergency procedures refer to plant provisions for conserving and replenishing water, the operator may have difficulty managing the accident. If the emergency core cooling system water is not replenished, an ISLOCA may lead to core damage, even after the leak has been isolated.

The GSI 105 resolution program also produced information useful in determining likely locations of breaks in low-pressure systems (Refs. 7 and 8).

Resolution of Generic Safety Issue 105

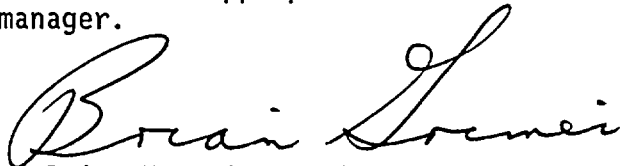
The NRC staff gave this issue a high priority ranking and pursued its resolution. In resolving the issue, the staff conducted analyses of units representative of all nuclear steam supply system vendors and considered human errors, component fragilities and the survivability of recovery equipment (References 1-6), concluding that the units studied posed little risk from ISLOCA. The study of ISLOCA at a boiling water reactor confirmed past studies, which indicated little risk contribution from ISLOCA sequences. The staff found that ISLOCAs at pressurized water reactors were plant-specific in nature but noted that the ongoing IPE program includes licensee analysis of ISLOCA sequences. Thus, in the resolution of GSI 105, it was recognized that licensees and applicants, in response to Generic Letter 88-20, were already performing IPEs to identify and take steps to prevent or mitigate severe accident sequences, including ISLOCAs, at their plants. This ongoing IPE program together with the relatively small core damage frequency contribution from ISLOCA identified in the completed PRAs, resulted in the conclusion (References 7 and 8) that participation in the IPE program was sufficient to resolve GSI 105. Thus, this issue was resolved and no new requirements were established, as documented in NUREG-0933, "A Prioritization of Generic Safety Issues," as issued June 30, 1993.

Information in References 1-6 contain the latest ISLOCA analyses by the NRC staff and contractors. Likely areas of greatest interest to IPE analysts are the following:

- pressure isolation valve initiating events, (hardware faults, human errors, test and maintenance procedures or combinations of these items)
- pressure-induced failure or rupture of the interfacing system
- rupture detection and diagnosis
- isolation of the rupture
- mitigation of accident sequences

Reference 1 lists significant items in each of these areas and presents a screening procedure for rapidly identifying gross ISLOCA vulnerabilities, using numerical scores based on values assigned to the status of significant items in these areas.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please call one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.



Brian K. Grimes, Director
Division of Operating Reactor Support
Office of Nuclear Reactor Regulation

Technical contacts: Gary Burdick, RES
(301) 492-3812

Vern Hodge, NRR
(301) 504-1861

Attachments:

1. List of References
2. List of Recently Issued NRC Information Notices

LIST OF REFERENCES

1. W. J. Galyean et al., "ISLOCA Research Program Final Report," NUREG/CR-5928, July 1993.
2. W. J. Galyean and D. I. Gertman, "Assessment of ISLOCA Risk - Methodology and Application to a Babcock and Wilcox Nuclear Power Station," NUREG/CR-5604, May 1992.
3. D. L. Kelly, J. L. Auflick, and L. N. Haney, "Assessment of ISLOCA Risks - Methodology and Application to a Westinghouse Four Loop Ice Condenser Plant," NUREG/CR-5744, May 1992.
4. D. L. Kelly, J. L. Auflick, and L. N. Haney, "Assessment of ISLOCA Risks: Methodology and Application to a Combustion Engineering Plant," NUREG/CR-5745, May 1992.
5. D. A. Wesley et al., "Pressure-Dependent Fragilities for Piping Components," NUREG/CR-5603, October 1990.
6. D. A. Wesley, "Screening Methods for Developing Internal Pressure Capacities for Components in Systems Interfacing With Nuclear Power Plant Reactor Coolant Systems," NUREG/CR-5862, May 1992.
7. "Regulatory Analysis for the Resolution of Generic Issue 105: Interfacing System Loss of Coolant Accident in Light Water Reactors," NUREG-1463, July 1993.
8. Memorandum for Eric S. Beckjord from James M. Taylor, "Technical Resolution of Generic Issue 105 (GI-105) - ISLOCA in LWRs," June 21, 1993.

LIST OF RECENTLY ISSUED
NRC INFORMATION NOTICES

Information Notice No.	Subject	Date of Issuance	Issued to
94-13	Unanticipated and Un- intended Movement of Fuel Assemblies and Other Components due to Improper Operation of Refueling Equipment	02/22/94	All holders of OLs or CPs for nuclear power reactors.
94-12	Insights Gained from Resolving Generic Issue 57: Effects of Fire Protection System Actuation on Safety- Related Equipment	02/09/94	All holders of OLs or CPs for nuclear power reactors.
94-11	Turbine Overspeed and Reactor Cooldown during Shutdown Evolution	02/08/94	All holders of OLs or CPs for nuclear power reactors.
94-10	Failure of Motor-Operated Valve Electric Power Train due to Sheared or Dislodged Motor Pinion Gear Key	02/04/94	All holders of OLs or CPs for nuclear power reactors.
94-09	Release of Patients with Residual Radioactivity from Medical Treatment and Control of Areas due to Presence of Patients Con- taining Radioactivity Following Implementation of Revised 10 CFR Part 20	02/03/94	All U.S. Nuclear Regulatory Commission medical licensees.
94-08	Potential for Surveil- lance Testing to Fail to Detect an Inoperable Main Steam Isolation Valve	01/01/94	All holders of OLs or CPs for nuclear power reactors.

OL = Operating License
CP = Construction Permit

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Original signed by
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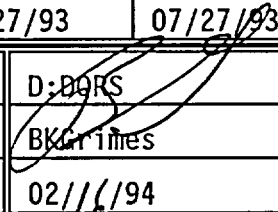
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November xx, 1993

BACKFIT DISCUSSION

In this generic letter supplement on ISLOCAs, the NRC is communicating to licensees the resolution of GSI 105 and the availability of information developed or obtained by the NRC during resolution efforts. The information described in this supplement is considered useful for developing submittals under previously issued Generic Letter 88-20 on the broader subject of severe accidents. For completed submittals, the information is useful to licensees who wish to use it in a confirmatory sense. In this supplement, the NRC asserts that licensee efforts begun under Generic Letter 88-20 are sufficient to resolve GSI 105 on ISLOCAs. Therefore, the present supplement does not represent a backfit.

If you have any questions about this information, please call one of the technical contacts listed below or the appropriate Office of Nuclear Reactor Regulation (NRR) project manager.

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Acting Associate Director for Projects
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